

REMARKS

The Examiner is thanked for the thorough examination of the present application. The Office Action, however, tentatively rejected all pending claims 15-32. Upon entry of the amendments in this response, claims 15-32 remain pending. However, Applicant has amended claims 15, 17, 21-22 and 24-25. In the amendments to claims 15 and 24, the term “approximately” has been removed. Similarly, in claims 22 and 25, the term “approximate” has been removed. Claim 17 has been amended to depending from claim 15, and claim 21 has been amended to address an antecedent basis issue. The Applicant submits that no new matter has been added to the application by the foregoing amendments.

Rejection under 35 U.S.C 112:

Claims 15-32 were rejected under 35 U.S.C 112, second paragraph, as allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner suggested spelling out the meaning of the abbreviation “DLC” in claim 15. Accordingly, claim 15 has been amended to recite diamond-like carbon, to spelling out the meaning of abbreviation “DLC,” as set forth in the specification (see page 1, line 23 of the specification).

Also, the Examiner stated that, in claim 15, it is not clear how the grinding and polishing step removes the third noble layer if the oxygen plasma has already removed the third noble layer. Accordingly, claim 15 has been amended to read: “partially removing the third noble metal layer using oxygen plasma” to clearly specify the claimed relationships. Applicant submits that claim 15 now clearly defines how the grinding and polished step remove the third noble layer.

For purposes of more clearly defining certain embodiments, claim 15 has also been amended to recite: “forming a second passivation film overlying the fourth noble metal layer, wherein the second passivation film comprises the same material as the passivation film overlying the third noble metal layer”.

Claim 21 has been amended to correct minor editorial problems. That is, “intermediate layer” has been replaced with “third noble metal layer.” This addresses a noted antecedent basis issue.

As amended herein, Applicant submits that all claims fully comply with all statutory requirements of 35 U.S.C. § 112, and that all rejections under this section be withdrawn.

Discussion of Rejections under 35 U.S.C 103(a)

Turning now to the substantive rejections, claims 15-16, 18-25, 27-28, and 30-32 stand rejected under 35 U.S.C 103(a) as being unpatentable over Applicant’s Admitted State of the Prior Art (AASPA) in view of Aoki (cited by Applicant). Applicant respectfully requests reconsideration for at least the reasons that follow.

With regard to the 35 USC 103 rejection, it is noted that AASPA discloses a method to renew a molding die comprised of a diamond-like carbon (DLC) passivation film overlying an intermediate layer by removing the DLC layer using oxygen plasma and grinding the intermediate layer; the intermediate layer is very thick such that renewing that layer is time-intensive. Noble metal layers such as Ir-Re based alloys are known for use on molding dies, but that such layers are only able to be removed by grinding.

However, AASPA discloses a molding die having a DLC layer acting as a passivation film of a substrate and an intermediate layer of silicon carbide or silicon nitride therebetween in

JP1320233. AASPA also discloses a molding die having a DLC layer, formed by sputtering, acting as a passivation film of a substrate, and two intermediate layers, silicon carbide and ion-implanted DLC, therebetween in JP6191864. AASPA also discloses a molding die having a DLC layer acting as a passivation film of a substrate and a consumable β -silicon carbide acting as an intermediate layer, which can be removing the DLC layer using oxygen plasma and grinding the β -silicon carbide layer to grain a predetermined shape in JP11079760. Aoki discloses an Ir-Re-C alloy as a passivation film directly on a tungsten carbide substrate with no intermediate layer therebetween.

In particular, Applicant respectfully asserts that AAPSA and the cited references, either individually or in combination, are legally deficient for the purpose of rendering obvious the a carbon-containing third noble metal layer overlying the second noble metal layer, and a diamond-like carbon passivation film overlying the third noble metal layer, as expressly recited in independent claim 15. Additionally, the claimed embodiments provide **a carbon-containing third noble metal layer acting as an intermediate layer between the substrate and the DLC passivation film of a molding die** to improve adhesion therebetween. Further, carbon atoms in the carbon-containing third noble metal layer prevent grain growth, resulting in improved heat resistance. The third noble metal layer's denser structure prevents elements in the substrate from diffusing into the passivation film when the third noble metal layer acting as the intermediate layer, preventing deterioration of the passivation film and increasing lifetime of the molding die.

The claimed embodiments further provide a DLC layer acting as a passivation film for the molding die and a carbon-containing third noble metal layer acting as an intermediate layer between the substrate and the DLC passivation film of the molding die, which is easily removed by oxygen plasma when renewing, to improve renewability and simplify renewing.

As specifically recited in independent claim 15:

15. A renewing method for a glass molding die, comprising:
providing a used glass molding die comprising a substrate, a first noble metal layer overlying the substrate, a second noble metal layer overlying the first noble metal layer, *a carbon-containing third noble metal layer overlying the second noble metal layer, and a diamond-like carbon (DLC) passivation film overlying the third noble metal layer;*
removing the passivation film and *partially removing the third noble metal layer using oxygen plasma;*
grinding and polishing the molding die to completely remove the third noble metal layer;
cleaning the polished molding die;
forming a fourth noble metal layer overlying the second noble metal layer;
and
forming a second passivation film overlying the fourth noble metal layer, wherein the second passivation film comprises the same material as the passivation film overlying the third noble metal layer.

(*Emphasis added.*) Claim 15 patently defines over the cited art for at least the reason that the cited art fails to disclose the features emphasized above.

Therefore, Applicant respectfully asserts that the rejection of claim 15 is deficient and should be withdrawn. Therefore, claim 15 is allowable. Insofar as claims 16, 18-25, 27-28 and 30-32 depend from claim 15, these claims are also allowable.

CONCLUSION

In view of the foregoing, it is believed that all pending claims are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

No fee is believed to be due in connection with this amendment and response. If, however, any fee is deemed to be payable, you are hereby authorized to charge any such fee to Deposit Account No. 20-0778.

Respectfully submitted ,

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